## REMARKS

The foregoing amendment amends Claims 1 and 13 to clarify the invention and cancels Claim 8. Claims 1, 4-7 and 10-14 are pending in the application, with Claims 10, 11 and 14 being withdrawn. For at least the following reasons Applicants believe that the rejections of Claims 1, 4-7, 12 and 13 should be withdrawn and that the claims are in condition for allowance.

## REJECTION OF CLAIMS 1, 4-8 AND 12 UNDER 35 U.S.C. 102(b)

The Examiner rejected Claims 1, 4-8 and 12 under 35 U.S.C. 102(b) as being anticipated by printed publication Tamura *et al.* ("Flat-ban ferromagnetism in quantum dot superlattices", Phys. Rev. B, Vol. 65, 085234, 2002) (hereinafter "Tamura"). In order to anticipate a claim under 35 U.S.C. § 102(b), a reference must disclose each and every element of a claim. M.P.E.P. § 2131. As discussed below, this rejection is respectfully traversed.

**Claim 1**

Amended Claim 1 incorporates the subject matter of canceled Claim 8 and clarifies that the respective quantum dots are allowed to have a different size from each other within a defined range. With respect to Claim 1, Tamura lacks one or more features of the claimed invention. Tamura discloses ferromagnetism in quantum dot arrays. In particular, Tamura discloses a ferromagnetic state created by arranging quantum dots on the nodes of "well-ordered lattices", specifically kagomé lattices, as shown in FIG. 1(b), and considers a Hubbard model (1) for these lattices, shown on page 085324-2. Tamura discloses quantum dot arrays having high precision lattice structures (*i.e.*, no fluctuation in lattice structure). Although Tamura does not specifically discuss fluctuation of lattice structures, it is well known in the art of material science that if the lattice spacing between quantum dots fluctuates on each position due to, for instance, a lattice defect, a flat-band structure of quantum dots on the lattice is destroyed, thereby decreasing or eliminating the transition

temperature exhibiting ferrormagnetism. This phenomenon is explained in terms of the band theory. Because Tamura discusses the possibility of flat-band ferromagnetism in quantum dot arrays, it is essential for the quantum dot arrays of Tamura to exhibit high precision lattice structures with no fluctuation.

The Examiner alleged that Tamura's system is a quantum mechanical system and that these systems are well known to permit fluctuations to occur. The Examiner cited page 085324-6 and alleged that Tamura describes that fluctuations occur on the spin-spin correlation function due to thermal excitations. However, there is no direct relationship between the thermal fluctuation of spin disclosed in Tamura and the functionality that each of the quantum dots "are allowed to have a different size from each other" as recited in amended Claim 1. Thermal fluctuation of spin means that the orientation of the spin of an electron in a quantum dot fluctuates due to thermal excitations. It does not imply individual quantum dot size fluctuation.

The Examiner also alleged that the present invention is directed towards a lattice structure. This is an mischaracterization due to a misreading of the "Summary of the Invention". In the first paragraph of this section, the Applicants simply describe some issues that are associated with a periodic lattice structure of a prior art material. *See* [0014]. In the Summary of the Invention, the Applicants do not assert that the present invention has such a high precision lattice structure or that the invention is directed towards a lattice structure.

The Examiner alleged that Tamura teaches that the device can modify the size of the dots (page 085324-5), which is a fluctuation in size. Although Tamura does disclose that the size of quantum dots can be changed by modifying the gate voltage, this is in regard to changing the size of all quantum dots uniformly (*i.e.*, all quantum dots must be the same size). In Tamura, size fluctuation of individual quantum dots is prohibited in order to maintain the transition temperature showing ferromagnetism. In contrast, in the present invention as claimed in Claim 1, "the respective quantum dots are allowed to have a different size form each other." Because the magnetic device includes a conductive electron region,

the magnetic device generates Ruderman-Kittel-Kasuya-Yoshida ("RKKY") interaction between quantum dots via the conductive electron region, and thus each quantum dot is capable of having a different size. The magnetic device of Claim 1 allows size fluctuation of individual quantum dots. *See e.g.*, [0105].

The Examiner alleged the device of Tamura is capable of allowing fluctuations of the magnitude claimed depending on the confinement energy. The Examiner did not cite to any paragraph or figure of Tamura supporting this assertion. Tamura does not disclose a magnetic device allowing size fluctuations of the magnitude as claimed in Claim 1.

Lastly, the Examiner alleged that Tamura discloses a magnetic body comprised of a conductive electron region as claimed in Claim 1. However, as discussed above, Tamura merely teaches a magnetic device composed of quantum dots on a periodic lattice structure, and does not teach or suggest the conductive electron region recited in Claim 1. Also, as discussed above, the Tamura device does not teach or suggest size fluctuation of individual quantum dots.

Tamura does not disclose a magnetic body "wherein the respective quantum dots are allowed to have a different size from each other with a fluctuation in a range that the size thereof along the confinement direction containing the at least one electron is less than $1/\pi$ times the Fermi wave length of the conductive electron" as claimed in amended Claim 1. None of the drawings or corresponding sections of the detailed description of Tamura cited by the Examiner show otherwise. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of Claim 1.

**Claims 4-7 and 12**

Claims 4 - 7 and 12 depend from Claim 1 and are patentable over Tamura for at least the same reasons as stated above for Claim 1. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of Claims 4 - 7 and 12.

**Claim 8**

As mentioned above, Claim 8 has been canceled. Accordingly, the rejection of Claim 8 is now moot.

**REJECTION OF CLAIMS 9 AND 13 UNDER 35 U.S.C. 103(a)**

The Examiner rejected Claims 9 and 13 under 35 U.S.C. 103(a) as being unpatentable over Tamura. As discussed below, this rejection is respectfully traversed.

**Claim 9**

With regard to Claim 9, Applicants respectfully submit that Claim 9 was previously canceled. Thus, the rejection of Claim 9 is moot.

**Claim 13**

With regard to Claim 13, for at least the following reasons, the Applicants respectfully traverse this rejection and request reconsideration and withdrawal thereof. The Examiner has not established a prima facie case of obviousness. To establish a prima facie case of obviousness, the Examiner must: (1) identify the reason why a person of ordinary skill in the art would have combined the teachings of the references; and (2) show that the references teach or suggest all of the claimed limitations, or sufficiently explain why the differences between the prior art and the claimed invention are obvious.

The Applicants respectfully submit that Tamura fails to disclose or suggest all of the limitations of Claim 13 as amended herein. Tamura does not disclose a conductive electron region as claimed in Claim 13. In particular, Tamura does not disclose or suggest the ferromagnetism of a magnetic body permitting size fluctuation of individual quantum dots. The magnetic device of the present invention can permit ferromagnetism even at room temperature on the basis of RKKY interaction between quantum dots via the claimed conductive electron region. *See e.g.*, [0088]. As discussed above, Tamura does not disclose or suggest a magnetic device "wherein the respective quantum dots are allowed to have a different size from each other with a fluctuation in a range that the size thereof along the

confinement direction containing the at least one electron is less than $1/\pi$ times the Fermi wave length of the conductive electron" as claimed in amended Claim 13. Tamura does not disclose or suggest the invention as claimed in Claim 13 as amended herein. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of Claim 13.

## EXAMINER INTERVIEW

The undersigned conducted an interview with the Examiner on June 17, 2008, to discuss the foregoing amendment and the Tamura reference. During the interview the participants discussed the difference between the quantum dot size as disclosed by the Tamura reference and the present invention. Although an agreement was not reached, the Examiner agreed that the amendment would clarify the difference.

## CONCLUSION

In light of the foregoing, Claims 1, 4 - 7, 12 and 13 are presented for examination in the application. It is respectfully submitted that the presented claims are allowable and a notice of allowance is respectfully requested. The Examiner is invited and encouraged to contact the undersigned attorney of record at (404) 685-6799 if such contact will facilitate examination of the application. For all fees required in connection with this filing, the Commissioner is hereby authorized to charge Deposit Account No. 11-0855.

Respectfully submitted,

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